

1. Introduction and Background

In 1995, the U.S. Environmental Protection Agency (EPA) instituted a program, the Environmental Technology Verification (ETV) Program, to verify the performance characteristics of commercial-ready environmental technologies through the evaluation of objective and quality-assured data. Managed by EPA's Office of Research and Development, ETV was created to substantially accelerate the entrance of innovative environmental technologies into the domestic and international marketplaces. The independent technology verifications generated through the ETV Program provide purchasers and permittees of technologies with an independent and credible assessment of the technology they are purchasing or permitting. This program was identified by the United States Coast Guard (USCG) as a valuable existing effort that could greatly facilitate the development of testing protocols for ballast water treatment technologies, in an effort to mitigate the introduction of non-indigenous species via ships ballast water to new environments. The EPA and the USCG subsequently signed an MOU to collaborate in the development and implementation of a component of the ETV Program focused on ballast water management. The USCG anticipates that the testing protocols and infrastructure resulting from this collaboration will also support the development of approval procedures for ballast water treatment systems.

Naval Research Laboratory (NRL) has partnered with the United States Coast Guard, and has designed, constructed and operates a prototype ETV Ballast Water Treatment System Test Facility, as specified by the Draft ETV Protocol for the Verification of Ballast Water Treatment Technologies. NRL and the USCG will conduct a pilot test of the ETV protocols at the Ballast Water Treatment Test Facility (BWTTTF) located at the NRL Key West (NRLKW), Florida. The pilot test will be conducted with a selected vendor who will supply a treatment system that a) best meets the characteristics of a commercial ready technology capable of safely and effectively treating ballast water aquatic nuisance species, and b) is most appropriate for use in a pilot test at the NRL site. While the testing will be conducted following the ETV Protocol, no ETV verification of the selected technology will arise from the results.

The BWTTTF functions as an instrumented scientific test platform for the evaluation of technologies designed to eliminate aquatic nuisance species in shipboard ballast. This land based facility provides for the uplift and discharge of ocean water into and from holding tanks representative of shipboard ballast systems. Evaluations of candidate ballast water treatment technologies will be performed in accordance with the Generic ETV Protocol for the Verification of Ballast Water Treatment Technologies, which is currently in a final draft status. Pumping capabilities provide flow rates up to 1320 gpm and include a 101,000 gallon test ballast tank, a 40,000 gallon control test tank, and a 104,000 gallon discharge tank. The facility provides for the injection of specified test organisms as well as the means for monitoring test conditions, sampling, and laboratory analysis. All water from testing will be treated prior to final discharge in accordance with existing site permit requirements. To accommodate as yet undefined/unidentified technologies for test, the system can be reconfigured to accommodate treatment systems

at uplift, in-tank, or discharge locations in the flow path. Testing operations may occur over continuous periods of up to several weeks.

Contact information for the BWT Test Facility is provided in the table below. The following addresses can be used for the facility:

Postal:
Naval Research Laboratory
PO Box 1739
Key West, FL 33040
305-293-4214

Shipping:
Naval Research Laboratory
Bldg F-14, Fleming Key
Trumbo Point Annex
Key West, FL 33040

Point of Contact	Inquiry	Phone	Email
Edward Lemieux	NRL Programs & Primary POC	305-293-4214	elemieux@ccs.nrl.navy.mil
Jonathan Grant	Technical and Test	617-618-4626	jgrant@geo-centers.com
Wayne Hyland	NRL KW Facilities Engineering	305-293-4214	whyland@ccs.nrl.navy.mil
Cheryl Sellers	Logistics / Administrative	305-293-4214	csellers@ccs.nrl.navy.mil

2. Requirements for Ballast Water Treatment Systems

The ETV Protocol is not designed for evaluation of developmental technologies at this time. Equipment submitted for consideration for testing at the BWTTF should be qualified for marine installation and use. Requirements for shipboard ballast water treatment systems to undergo pilot testing are provided in this section. (These requirements are not part of the ETV Protocol, but are intended to assure that the technology used in this pilot test will meet a minimum design level to accommodate testing. In the ETV testing, many of the requirements will be part of the evaluation and verification of the technology.) Any vendor with ballast water treatment equipment that meets these requirements and is interested in participating in this pilot test will need to provide technical documentation as described in Section 3. If selected, the vendor will work with NRLKW to develop an approved test plan, and their system will undergo verification testing at the BWTTF. The test process and protocols are described in the ETV Generic Protocol for the Verification of Ballast Water Treatment Technologies. A link to the website hosting this document can be found in the References section.

2.1. General Requirements

2.1.1. The Ballast Water Treatment System should be robust and suitable for working in the marine environment, should be of a design and construction adequate for the service for which it is intended and should be designed and constructed so that installed units reduce to a minimum any danger to persons on board, due regard being paid to hot surfaces and other hazards. The design should have regard to materials used in construction, the purpose for which the equipment

is intended, the working conditions to which it will be subjected, and the environmental conditions that can be expected on board ships.

2.1.2. The System should be designed to function automatically for a minimum of 24 hours. There should be no need for any manual adjustment to valves and other equipment to bring the system into operation. However, the system should incorporate fail-safe arrangements to avoid any accidental discharge or undesirable conditions.

2.1.3. The System should be strongly constructed and design suitable for shipboard use, although testing under the current program will be occurring at a land based facility. The design should incorporate appropriate materials and engineering approaches for operation and maintenance in a shipboard environment.

2.1.4. The Ballast Water Treatment System ideally will be designed to operate when upright and when inclined at any angle of list up to and including 15° either way under static conditions and 22.5° under dynamic conditions (rolling) either way and simultaneously inclined dynamically (pitching) 7.5° by bow or stern.

2.1.5. System operation should be able to be initiated, controlled and monitored by a single individual, and should require minimal interaction or attention once normal equipment operation is initiated.

2.1.6. All working parts of the System that are liable to wear or to damage should be easily accessible for maintenance. The routine maintenance of the System and troubleshooting procedures should be clearly defined by the manufacturer in the Operating and Maintenance Manual.

2.1.7. If the Vendor's System includes any chemicals which are used in the treatment process, relevant Federal and State permitting requirements must be identified. In addition, the following requirements apply:

2.1.7.1. The System should not contain or use any substance of a dangerous nature, unless adequate arrangements for application, and safe handling in accordance with OSHA requirements, are provided to eliminate any hazards introduced thereby.

2.1.7.2. Chemical additive must be registered with the US EPA or a letter from the EPA must specifically provide for experimental use of the substance, or declare that the substance does not require registration under existing regulations.

2.1.7.3. Results must be provided from a qualified test laboratory for Whole Effluent Toxicity Testing of the effluent from a unit that is not significantly different from the unit to be tested by the facility.

2.1.7.4. Relevant calculations must be provided for the anticipated maximum and minimum amounts of active chemicals required for treatment on a per volume basis with relevant anticipated concentration of by-products in treated ballast water.

2.2. Installation Requirements

2.2.1. All piping, valves and fittings shall comply with regulations and marine industry standards as contained in 46 CFR Part 56. Pressure piping shall be fitted with relief valves set not to exceed maximum allowable working pressure.

2.2.2. Electrical and electronic components in AC systems are to be capable of operating satisfactorily under normally occurring variations in voltage and frequency. Unless otherwise stated, the variations from the rated value may be taken from the table below. DC system devices are to be capable of operating satisfactorily at minus 15% voltage. Conductors, power supply, and over-current protection shall be provided in accordance with 46 CFR Subchapter J and appropriate marine industry standards.

2.2.2.1.

<i>Quantity in Operations</i>	<i>Permanent variation</i>	<i>Transient Variation</i>
Frequency	±5%	±10% (5s)
Voltage	+6%, -10%	±20% (1.5s)

2.2.3. Operating conditions and tolerances for facility supplies of water pressure and flow, power conditions, air pressure and flow, or any other requirements specific to the treatment technology must be clearly identified in system documentation.

2.2.4. System design should provide for appropriate lift and/or hoist points during installation. Center of gravity, no step areas and other installation specific information should be clearly identified. Any areas presenting a hazard to personnel during installation, checkout, and operation should be visibly marked.

2.2.5. Recommendations to ensure post-installation operator access to maintenance ports, access panels, and field replaceable units (FRUs) should be clearly identified in an installation guide with appropriate layout diagrams.

2.3. Operating and Maintenance Requirements

2.3.1. The Ballast Water Treatment System should be designed and constructed to ensure that user access is restricted to essential controls for normal operation of the system. Access beyond these controls should be available for emergency maintenance and temporary repair but must require the breaking of security (lockout) seals or activation of another device which indicates an entry to the equipment.

2.3.2. The Ballast Water Treatment System should provide capability for efficient maintenance and repair operations, and should have a high mean-time between failure (MTBF). Minor and major maintenance schedules, pre-requisite training, level of effort and recommended spares / supplies should be detailed in the appropriate section of the O&M Manual. Adequate documentation, including drawings, diagrams and instructions necessary for routine maintenance, troubleshooting and repairs should also be provided.

2.3.3. Any potential exposure to hazards or hazardous materials which are involved in the maintenance or operation of the equipment must be minimized. Explicit warning labels identifying the hazard must be installed in accordance with OSHA and/or other appropriate federal regulations, and procedures for working with said hazards clearly identified in the operating instructions.

2.3.4. Any by-product, disposable component, or FRU which presents a safety or environmental hazard must be explicitly identified along with procedures for material handling and disposal according to relevant regulations.

2.3.5. The vendor must provide technical support for this system via phone and internet. Contact information for both methods must be identified.

2.3.6. In addition to the requisite treatment equipment, the vendor is required to supply a suitable quantity of critical spares and maintenance supplies to ensure uncompromised operation of the System over the duration of the pilot test. Critical components are those whose failure will invalidate or impede successful completion of the test.

2.4. System Performance Requirements

2.4.1. Discharge water quality specifications should reference current EPA regulations or recommendations for shore discharge standards per 40 CFR Chapter 1 and specify requirement or exemption from requirement of National Pollutant Discharge Elimination System (NPDES) permitting.

2.4.2. Treatment capabilities over the anticipated range of maritime environmental conditions as defined in the ETV Protocol must be identified by the vendor. The effects of extremes in temperature, turbidity, biomass density, or other environmental conditions which may impact efficacy of the treatment technology must be noted where these may cause variations in vendor performance specifications.

2.4.3. The Ballast Water Treatment System should be provided with simple and effective means for its operation and control which minimizes operator requirements. It should be provided with a control system that ensures services needed for the proper operation of the Ballast Water Treatment System are provided through automatic arrangements, and promptly alerts operators when conditions warrant human intervention. The operator should be able to control all system functions through a single Control Unit, which should provide the following capabilities:

2.4.3.1. Automatically monitor and adjust necessary treatment dosages or intensities or other aspects of the System, or the ballast water system of the vessel, which while not directly effecting treatment are nonetheless required for proper administration of the necessary treatment.

2.4.3.2. A continuous self-monitoring function during the period in which the System is in operation. In addition to actively monitoring system operation, the

Control Unit should include a recording device located in a position easily accessible to the person in charge of the System. This device should both provide to the operator and continuously log the parameters listed below during ballast water treatment:

- 2.4.3.2.1. Proper functioning and operational status of all the services needed for the proper operation of the Ballast Water Treatment System
- 2.4.3.2.2. All parameters that are necessary to ensure the proper operation of the Ballast Water Treatment System
- 2.4.3.2.3. Status of the valves present in the Ballast Water Management System including those leading to overboard discharge
- 2.4.3.2.4. Total quantity of ballast water treated
- 2.4.3.2.5. Ballast water treatment rates
- 2.4.3.2.6. Alarm conditions
- 2.4.3.2.7. Date and time of start and end of the treatment operation
- 2.4.3.2.8. Ballast operation monitored (upload, discharge, transfer)
- 2.4.3.2.9. Calibration and maintenance events
- 2.4.3.2.10. Other system events of interest
- 2.4.3.3. Display to the operator all relevant and necessary measurement information required for control and monitoring operation of the system. The accuracy of meters and sensors designed to measure the suite of parameters appropriate and necessary for control of the System should be such that the readings will represent the actual value of the parameters being monitored within 10%. The accuracy should remain within the above limit despite the presence of contaminants normally expected in ballast water and the operational environment of the System.
- 2.4.3.4. Diagnostics to enable the local operator to check the functioning of the electrical and electronic circuitry, and calibration of meters and sensors according to the manufacturer's specifications.
- 2.4.3.5. An emergency manual override function to be used in the event of failure of the Control Unit.
- 2.4.3.6. Audio and visual alarms and a recording in the event there is discharge of any effluent or a component failure whenever the Control Unit is not fully operational.
- 2.4.3.7. A means to print reports and logged data. Required data should be printed out, as applicable, or may be stored electronically with printout capability, upon the following events:
 - 2.4.3.7.1. when the system is started
 - 2.4.3.7.2. when the system is stopped
 - 2.4.3.7.3. when an alarm condition develops
 - 2.4.3.7.4. when normal conditions are restored
 - 2.4.3.7.5. when manual override is engaged
- 2.4.4. In order to document system performance and identify quality assurance programs, certifications or quality assurance documentation should be provided by the manufacturer for all QA/QC and factory testing which occurs during the manufacture of the equipment. Relevant standards traceability data should also be provided.

2.4.5. The operator is assumed to be shipboard personnel. Minimal additional special training or qualifications should be required to operate the treatment technology system. Any requisite training materials / qualifications must be identified and supplied by the vendor.

2.4.6. In case of a single failure compromising the proper operation of the Ballast Water Treatment System, audible and visual alarm signals are to be given in all stations from which ballast water operations are controlled. Alarms and safety conditions: Audio-visual alarms should be activated for any of the following conditions:

- 2.4.6.1. Power failure to the system or any subsystem
- 2.4.6.2. Failure of any sensor, meter, or recording device
- 2.4.6.3. Hazard condition detected by control system
- 2.4.6.4. Any other failure which impairs system operation or performance

2.5. Calibration and Test Requirements

2.5.1. Diagnostic routines and procedures to maintain accuracy of measured process parameters should be provided. Diagnostics should be automated as much as possible. Self-test routines should be incorporated as part of the control unit, and the manufacturer should specify appropriate diagnostic intervals. Diagnostics should either confirm that parameters are within specifications or that calibration is required.

2.5.2. Diagnostics should also be provided for fault checking, system maintenance and repair. These types of diagnostics may be automated as well, and must also be able to be manually initiated by the operator. These types of diagnostics should isolate faults down to field replaceable units (FRUs).

2.5.3. The accuracy of the System components that take measurements should be verifiable according to the manufacturer's instructions.

2.6. System Documentation Requirements

2.6.1. Specifications must be provided which detail requirements and tolerances for the following system parameters:

- 2.6.1.1. Ballast water turbidity, pressure, temperature and flow rate ranges (include any other applicable criteria)
- 2.6.1.2. Electrical power requirements
- 2.6.1.3. Air / pneumatic pressure and flow rate ranges
- 2.6.1.4. Weight
- 2.6.1.5. Dimensions
- 2.6.1.6. Environmental limitations (eg, ambient temperature)
- 2.6.1.7. Treatment limitations

2.6.2. The vendor should provide a complete list of procedures for unpacking and verifying contents of shipped items.

2.6.3. Installation procedures and requirements must be well documented in an installation guide, and cover all areas of mechanical, electrical, hydraulic, pneumatic, and any other interface requirements. (Note that the installation at the BWTTTF is outdoors and exposed to ambient weather conditions. Any requirements for protection from these conditions must be addressed.) Time estimates in man-hours should be provided for installation procedures. Applicable standards must be referenced, and special precautions and hazards must be identified. Appropriate diagrams, photographs and/or assembly drawings should detail footprints, attachment points, interfaces, and any referenced components or subassemblies. These requirements may be relaxed should the Test Plan call for the vendor to be on-site to support System installation.

2.6.4. An Operations and Maintenance Manual(s) must be provided with the system.

2.6.5. If not included in the O&M Manual above, ancillary documentation must be included which provides detailed information for the following:

- 2.6.5.1. Piping and Instrumentation Diagrams
- 2.6.5.2. Electrical schematics and wiring diagrams
- 2.6.5.3. Photographs
- 2.6.5.4. Guides for diagnostics and troubleshooting
- 2.6.5.5. Parts Lists
- 2.6.5.6. Required operator training

3. Tech Data Package Submission

A technical data package must be submitted by the vendor of Ballast Water Treatment System in order to be considered for assessment at the NRL Key West ETV BWTT Facility. This technical data package is required to ensure that sufficient information is available to evaluate technologies and to plan and conduct a test. Vendor specific performance objectives should be identified along with relevant existing performance data.

The information in the technical data package should demonstrate that the treatment processes are well characterized and the equipment is designed to meet specific ballast water management performance criteria at the intended operational scale. Photographs with appropriate reference scales should be included in the data package. It should also document operational and maintenance requirements and conditions. This section provides a listing of the information required for inclusion in the technical data package. References are provided to the Section 2 Performance Requirements which further identify the desired types of information. At a minimum, the technical documentation provided by the vendor should communicate how these referenced requirements are met.

The information required for this assessment should be compiled and presented according to the format below. Much of the required information will likely be available in the vendor Operation and Maintenance Manual(s), which are called out as part of the

required documentation. However, the information presented in an O&M Manual will vary by vendor. In order to be considered for the pilot test under the ETV Protocol at the BWTTF, vendors are required to submit a technical documentation package in accordance to the format provided below. This allows each vendor the opportunity to incorporate those data most appropriate to the content topic. In addition to the Technical Data Package and the O&M Manual(s), vendors may also provide ancillary reference information through any combination of manuals, product literature, and electronic files. Any such ancillary information must be clearly identified as such, and the intended purpose of providing the information clearly stated.

The document must be submitted on standard 8.5" x 11" sized pages using 12 point Times New Roman as the main typeface. The ten main sections must be separated by tabbed divider pages. The cover page provided in Appendix A should be filled out with the appropriate vendor information to serve as the cover page for the submission. Three hardcopy and three electronic copies on CD (either Microsoft Word or Adobe Acrobat format) must be provided with the submission. Ancillary documentation not available in electronic format may be provided in hardcopy only.

3.1. Format for the Ballast Water Treatment System Technical Data Package

- I. Cover Page
- II. Table of Contents
- III. General Description & Capabilities (Marketing and technical specs per 2.1 and other items below)
 - a. System volume, weight, power & mechanical interface requirements (see also 2.6.1)
 - b. Target system procurement and operating costs (no specified requirement – vendor should provide standard pricing information along with approximate procurement and anticipated operating costs for the system proposed for ETV testing)
 - c. Vendor performance objectives (vendor should describe primary and non-primary objectives of ETV testing)
- IV. Target operating environments and conditions (see 2.1, 2.6.1)
 - a. General Features
 - b. Permitting and Certifications (see also 2.4.4)
 - c. Scalability (no specified requirement – please address range of applicable ballast system sizes for the described treatment technology. Note that the maximum scale that can be accommodated by the BWTTF is a unit processing at a rate of 1320 gpm or a volume of 101,000 gals.)
- V. Installation Requirements and Instructions (see 2.2, 2.6.3 and other items below)
 - a. Hydraulic and mechanical connections (esp. 2.2.1)
 - b. Electrical connections to mains (esp. 2.2.2)
 - c. Hazard locations (esp. 2.2.4)
 - d. Other special installation criteria / handling (esp. 2.2.3, 2.2.4, see also 2.6.2)
 - e. Considerations for maintenance / consumables / repair (esp. 2.2.5, see also 2.3.1)
 - f. Shipping and delivery considerations (no specified requirement – vendor should describe ability / methods to transport treatment technology to the BWTTF)
 - g. Interfacing for performance monitoring, alarms & controls (no specified requirement – vendor should describe available options)
- VI. Operating and Maintenance Instructions (see 2.3 and other items below)
 - a. Operating and Maintenance Manual (see also 2.1.6, 2.6.4, provide as standalone document(s))
 - b. Training Materials (see also 2.6.5.5)
 - c. Repairs and Troubleshooting (esp. 2.3.2)
 - d. Recommended Spares (and sources) (esp. 2.3.2, 2.3.6)
 - e. Safety Precautions and Issues (esp. 2.3.1, 2.3.3)
 - f. Environmental Hazards and Issues (esp. 2.3.3)
 - g. Expendables, Materials Handling, and Waste Disposal (esp. 2.3.4)

- h. Technical Support contact information (esp. 2.3.5)
- VII. System Performance Specifications (see 2.4 and other items below)
 - a. Discharge water quality (esp. 2.4.1)
 - b. Treatment capabilities and expected residual characteristics vs. environmental test conditions (esp. 2.4.2)
 - c. Control features and capabilities (esp. 2.4.3)
 - d. Factory testing criteria and procedures (esp. 2.4.4)
 - e. Human operator requirements (esp. 2.4.5)
 - f. Data Storage (esp. 2.4.3.2, 2.4.3.7)
 - g. Automated capabilities (esp. 2.4.3)
 - h. Alarms and safety capabilities (esp. 2.4.3.6, 2.4.6)
- VIII. Calibration and System Test Procedures (see 2.5 and other items below)
 - a. Diagnostics (esp. 2.5.1, 2.5.2)
 - b. Quality assurance during operation (see also 2.4.3.2)
 - c. Calibration schedules and procedures (esp. 2.5.1, 2.5.3)
- IX. Detailed Description of System Operation
 - a. Theory, processing and principles of operation (no specified performance requirement – vendor should provide background on how and why treatment technology works)
 - b. Selection of materials used in fabrication (see 2.2.1)
 - c. Design considerations for marine applications (see 2.1, 2.2.1)
- X. Ancillary Documentation Package (this section is for required documentation not referenced elsewhere)
 - a. Reference drawings and photographs (see 2.6.5)
 - b. Materials / parts lists (see 2.6.5)
 - c. Certifications (see 2.4.4)
 - d. Test Results / Qualification Data (no specified requirements – this should be results of vendor and/or independent testing of system performance)

4. Evaluation Criteria for Selection of BWT System Vendor

The vendor chosen to participate in the pilot ETV tests at the BWTTTF will be selected from those responders who best meet the criteria listed below. Note that the preferred outcome of the test is to validate a technology or treatment system which is capable of meeting the performance requirements, and preference will be given vendors who have sufficiently mature and demonstrable technologies suitable for ballast water treatment.

4.1. Performance

Based on responses received, treatment systems will be evaluated for the following:

4.1.1. Suitability for shipboard installation: The equipment described in the tech data package will be assessed for its suitability in shipboard installation and its ability to perform in the marine environment.

4.1.2. Performance capabilities: Vendor equipment must meet the definition of ballast water treatment technologies per the ETV Generic Protocol (Section 3.1 of the ETV Protocol). The claims for system performance must provide for effective biological treatment, operational and maintenance performance over the full range of challenge conditions, and be suitable for verification testing according to the Protocol.

4.1.3. Technical justification of performance claims: The information provided in the tech data package will be assessed with regard to the engineering descriptions of system design and methods of system operation to achieve the claimed system performance.

4.1.4. Quality of technical data package submission: Each of the Performance Requirements identified should be adequately addressed by the vendor documentation according to the requested format.

4.2. System availability

The availability of treatment systems for installation and test commencing in the August 2005 time frame is desired, but is negotiable. The degree of vendor support for these tests on an as needed basis is also a selection criteria.

4.3. Installation requirements

The system must be suitable for transport to NRL Key West. The system should also be suitable for installation and operation by personnel at the BWTTF. Discharge quality, materials handling, safety aspects and other logistical requirements will be evaluated for compatibility with BWTTF capabilities.

4.4. Resource funding / cost sharing

The ability of the vendor to support the pilot test through cost sharing or other means will also be considered. At a minimum, the vendor is expected to provide for transport of equipment to and from the BWTTF, provide equipment at no charge to NRLKW, provide critical system components and provide ancillary support to the tests as required.

4.5. Suitability for evaluation per the ETV Protocol

Finally, the technology will be assessed for its overall potential to provide successful results against the ETV test protocols.

5. References

5.1. ETV Vendor Qualification Requirements

The latest version of this document can be downloaded from the NRLKW website at <http://www.nrlkw.com/>.

5.2. ETV Draft Generic Protocol for the Verification of Ballast Water Treatment Technologies

The latest available version of this document can be downloaded from the NRLKW website at <http://www.nrlkw.com/>.

5.3. NRL Key West Ballast Water Treatment Test Facility

The NRLKW BWTTF website can be found at <http://www.nrlkw.com/>.

Appendix A

Cover Page for Ballast Water Treatment System Technical Data Package

Submitted by (Provide company name, address, phone, website, email, shipping address if different from above)

Technical information point of contact:

Treatment technology name:

Model ID of system proposed for test:

Target date system is available for test:

Submission date:

Please submit to:

Edward J. Lemieux
Corrosion Engineering, Head
Center for Corrosion Science & Engineering, Code 6130
Naval Research Laboratory
Building F-14, Fleming Key
Trumbo Annex
Key West, FL 33040

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